

May 18, 1965

LE GRAND H. LULL
HIGH LIFT MOBILE LOADER

3,184,086

Filed May 15, 1963

5 Sheets-Sheet 1

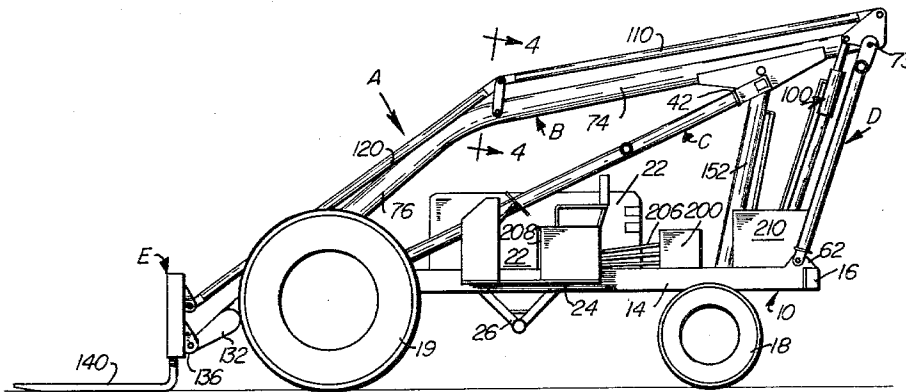


FIG. 1

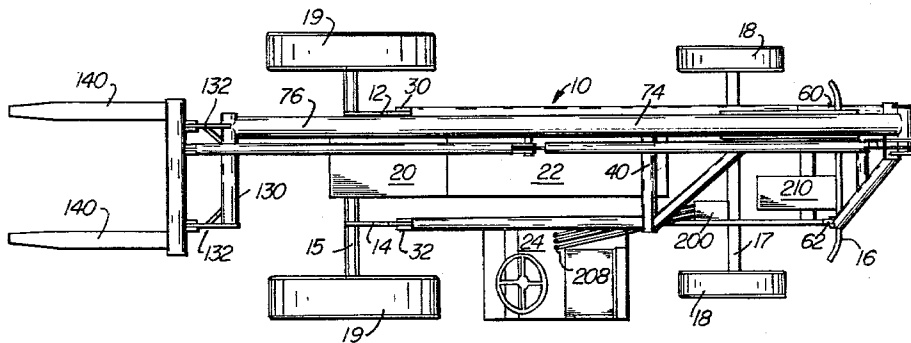


FIG. 2

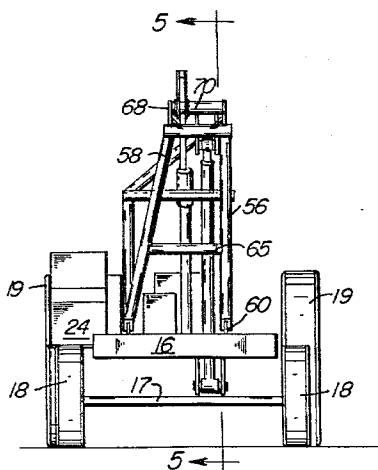


FIG. 3

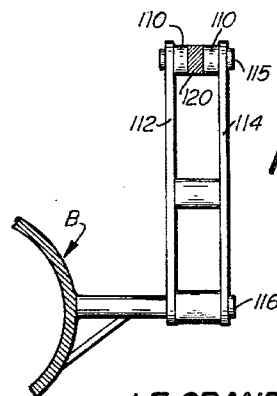


FIG. 4

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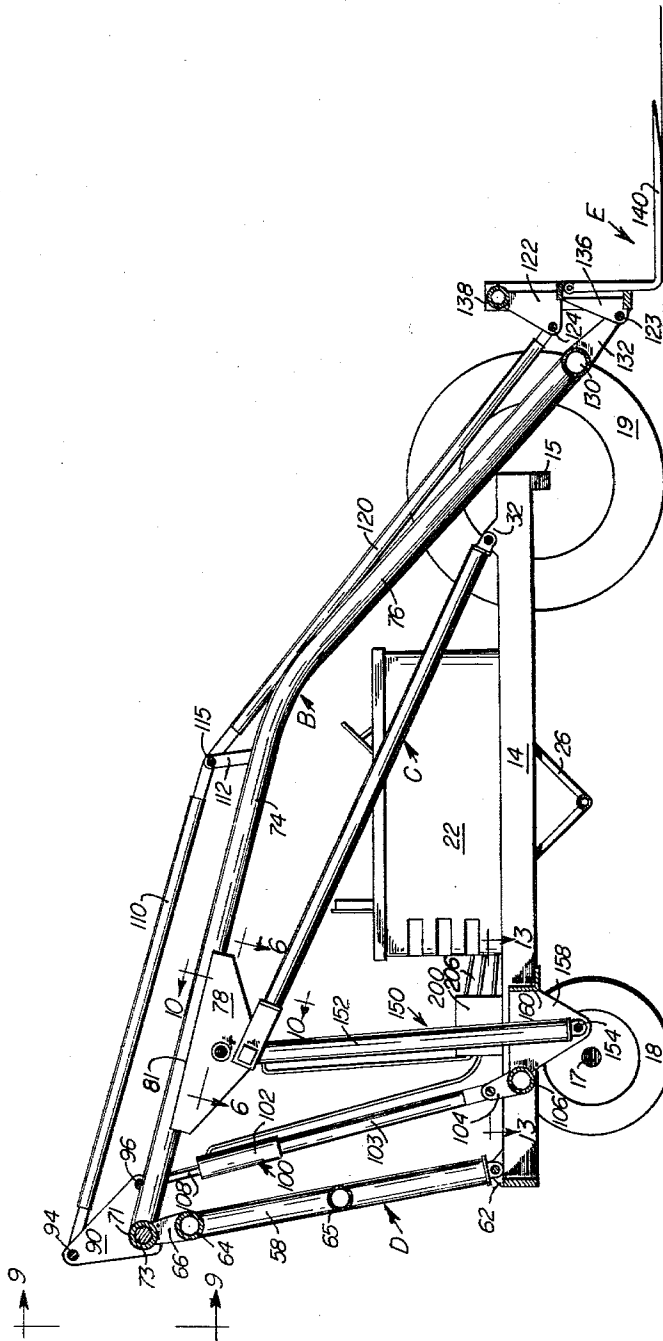


FIG. 5

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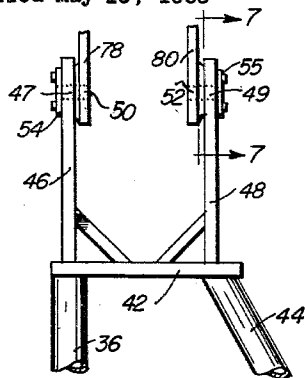


FIG. 6

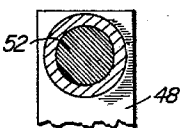


FIG. 7

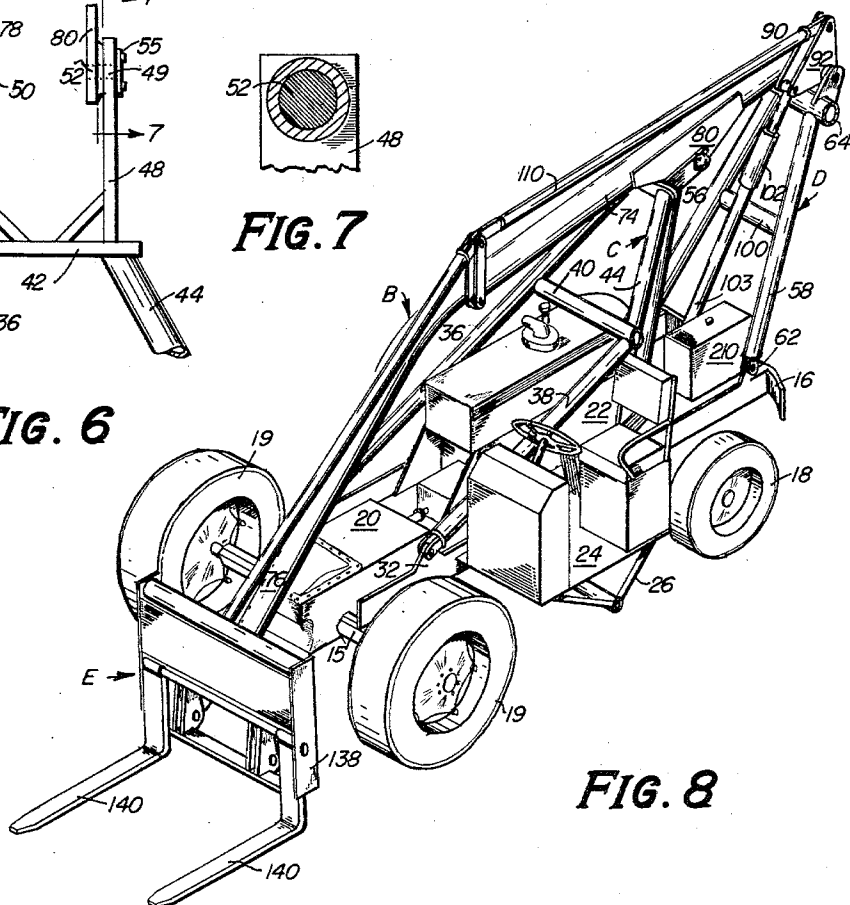


FIG. 8

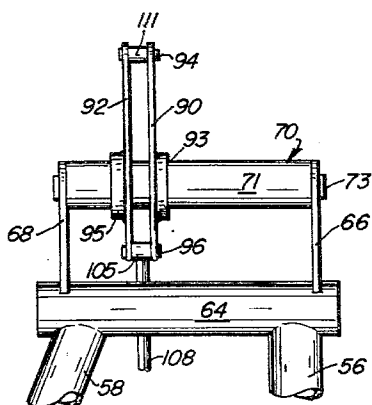


FIG. 9

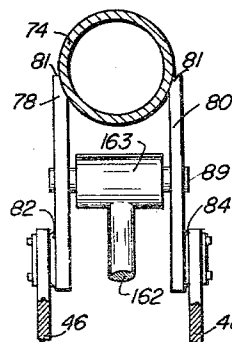


FIG. 10

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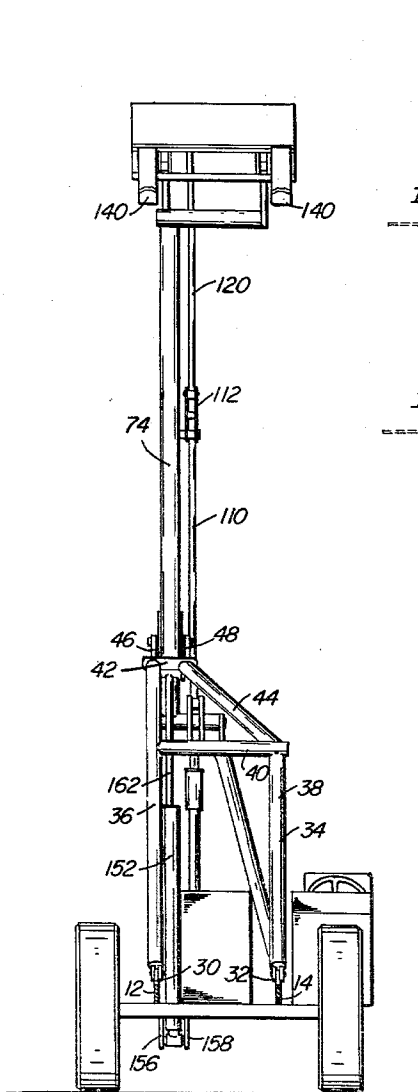


FIG. 12

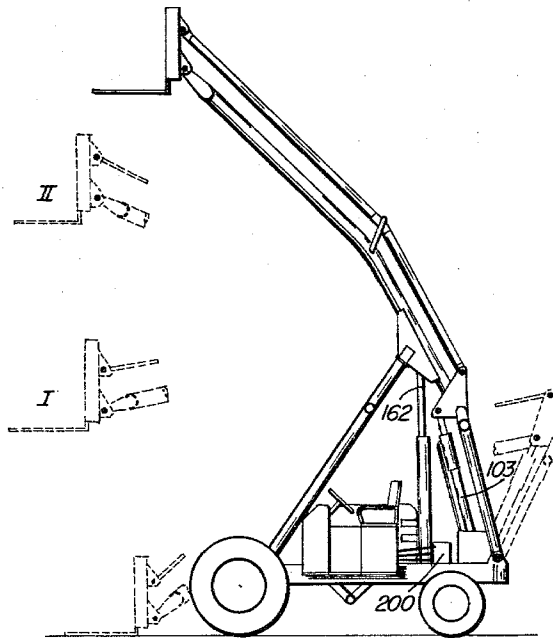


FIG. 11

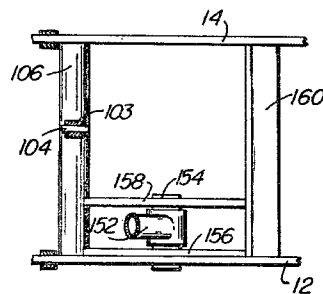


FIG. 13

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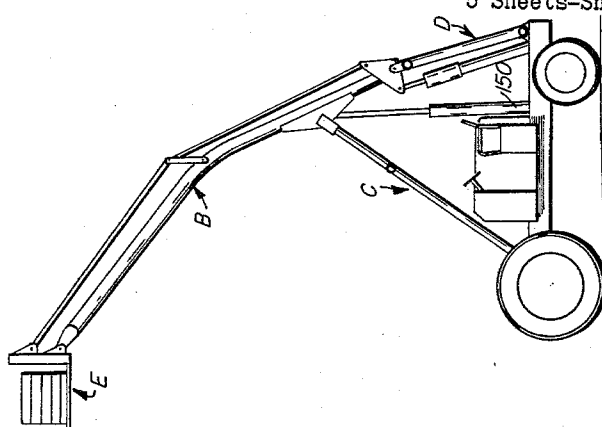


FIG. 17

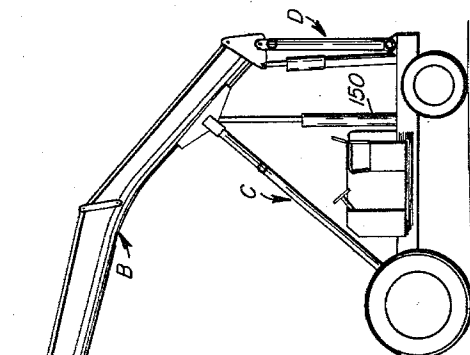


FIG. 16

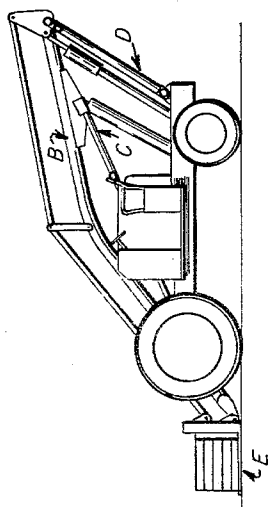


FIG. 14

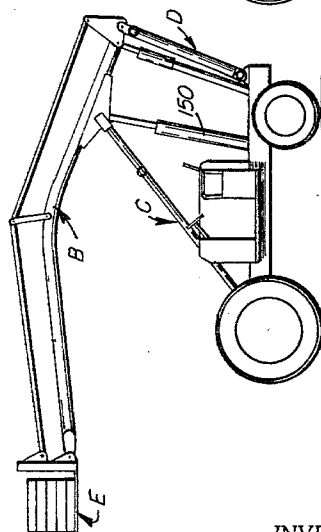


FIG. 15

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HIGH LIFT MOBILE LOADER

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9 Claims. (Cl. 214-140)

This invention relates to an improved high lift mobile loader that can be used in a variety of ways for on-the-ground construction site material handling, for elevating ton-sized loads of brick, block, lumber, concrete and the like, and more particularly, but not necessarily exclusively, to improved apparatus of this type characterized by a single tubular boom arm having lifting and reaching movements imparted thereto by novel hydraulic means.

The general object of the invention is to provide an improved high lift mobile loader. Other objects of the invention are: to provide a high lift mobile loader characterized by unique geometry of design incorporating a single lift arm or boom and a pivotal support therefor; to provide improved apparatus of this type including means for facilitating a forward reach for the lift arms in the most ideal working height range of the machine; to provide an improved high lift loader of this character including means for mounting the pivoted load carrying parts whereby to prevent whipping and consequent load spillage; to provide an improved high lift mobile loader having structural and functional characteristics which afford the operator maximum safety and unobstructed visibility of the load and the surrounding area; to provide unique means for pivotally mounting a lift arm on a high lift mobile loader whereby to achieve economy of structure, ease of operation, and generally improved lifting and reaching characteristics; and in general, to provide an improved high lift mobile loader which is highly versatile and dependable in operation, simple and inexpensive to construct, and rugged and long wearing in service.

These and other objects and advantages of the invention will become more fully apparent from a consideration of the following detailed description and accompanying drawings wherein a preferred embodiment of the invention is shown by way of illustration and not by way of limitation.

In the drawings:

FIGURE 1 is a side view of the machine;

FIGURE 2 is a top view thereof;

FIGURE 3 is a rear elevational view of the machine;

FIGURE 4 is an enlarged fragmentary view, partially in section, taken on the line 4-4 of FIGURE 1;

FIGURE 5 is an enlarged view, partially in section and with parts removed, taken along the line 5-5 of FIGURE 3;

FIGURE 6 is an enlarged fragmentary view taken along the line 6-6 of FIGURE 5;

FIGURE 7 is a sectional view taken along line 7-7 of FIGURE 6;

FIGURE 8 is a perspective view of the machine;

FIGURE 9 is an enlarged fragmentary view taken along the line 9-9 of FIGURE 5;

FIGURE 10 is an enlarged fragmentary view, partially in section, taken along the line 10-10 of FIGURE 5;

FIGURE 11 is a side view of the machine with its boom in a raised position, the dotted lines showing certain parts in alternate positions;

FIGURE 12 is a front view of the machine with its boom in a raised position;

FIGURE 13 is a fragmentary view, partially in section, taken along the line 13-13 of FIGURE 5; and

FIGURES 14-17, inclusive, are side views of the machine showing its reaching characteristics.

Generally speaking, mobile loaders for high lift reach-

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ing uses employ straight tower, telescopic masts or parallelogram type rear linkage structure to provide raising and reaching movements for their lift arms. These machines usually have a great many working parts including complex hydraulic systems and boom structure characterized by spaced parallel lift arms.

My invention seeks to overcome some of the disadvantages of these machines by providing a high lift loader having a single lift arm pivotally mounted in a unique manner upon novel front and rear linkage structure. The lift arm is so arranged upon the linkage structure that but a single hydraulic cylinder is required to impart raising and lowering and reaching movements to the lift arm. This result is obtained in part by the mounting of the lift arm to one side of the longitudinal centerline of the machine. The offset position of the lift arm assembly, in addition to allowing for a great economy of parts, also increases to a large degree the visibility of the operator during all positions of the lift arm and its load. Self-levelling and tilting of the load under operator control is also provided.

Referring now to the drawings, the invention A includes a horizontal frame 10 having laterally spaced parallel longitudinal side rails 12, 14 rigidly secured at their forward ends to a forward axle housing 15 and at their rear ends by a lateral end member 16. A rear axle 17 carrying wheels 18 is mounted to frame 10 forwardly of end member 16. Forward driving wheels 19 are carried by axle housing 15 and suitably connected by differential and transmission assembly 20 to an engine 22. An operator control platform 24, mounted to the side of frame 10 outwardly of side rail 14, is supported by a lower support structure 26.

As will become apparent as the description proceeds, frame 10 provides support for a lift arm B that is pivotally mounted above frame 10 by a forward link structure C and a rear link structure D.

Forward link structure C includes a pair of laterally spaced parallel upstanding elongated tubular support members 36, 38, which are secured at their lower ends to brackets 30, 32, respectively, located near the forward ends of side rails 12, 14, respectively. Support member 36 overlies side rail 12 and is of greater length than support member 38. A rigid tubular cross member 40 connects the upper end of support member 38 with support member 36 intermediate the ends of support member 38. The upper end of link structure C is provided with a rigid flat cross plate 42 that is suitably connected at one end to the upper end of support member 36 and at the other end to a laterally inclined support member 44, which extends upwardly from the intersection of cross member 40 with support member 36. Secured to cross plate 42 and extending upwardly therefrom in spaced parallel relation are elongated side plates 46, 48. The upper ends of side plates 46, 48 are provided with holes 47, 49 which have a common lateral axis. Bearing pins 50, 52 are mounted in holes 47, 49 respectively, and grease covers 54, 55 are mounted on the outside of plates 46, 48 in abutting relation to pins 50, 52, respectively.

Rear link structure D includes spaced elongated tubular support members 56 and 58 which are secured at their lower ends to brackets 60 and 62, respectively. Support member 56 overlies side rail 12 throughout its length while support member 58 is laterally inclined from side rail 14 towards support member 56, both support members 56, 58 being connected at their upper ends by a rigid tubular cross member 64 and intermediate their ends by a rigid tubular cross member 65. Further provided are a pair of rigid upstanding elongated side plates 66, 68 which form spaced parallel upper extensions of support members 56 and 58. Connecting side plates 66, 68 is a

lateral bearing member 70. As can be seen from FIGURES 2, 3 and 8, bearing member 70 is slightly longer than cross plate 42 of link structure C.

Forward link structure C and rear link structure D pivotally support boom arm B which is carried thereupon above frame 10. Boom arm B, preferably tubular in cross-section, is characterized by an elongated generally straight rear section 74 and an elongated downwardly and forwardly inclined front section 76 to the end of which is pivotally mounted a load carrying device E. Rigidly secured to the sides of straight section 74 of boom arm B between its middle and rear end are a pair of depending gusset plates 78, 80 which provide means for pivotally connecting boom arm B with forward link structure C. Gusset plates 78, 80 also connect the upper end of the boom actuating means, as will be explained. Plates 78, 80 are generally triangular in shape with their base 81 being welded to each side of boom arm B, as shown in FIGURE 5.

The central lower part of gusset plates 78, 80 is provided with external annular shoulders 82, 84 which bear against side plates 46, 48, respectively, and rigidly receive bearing pins 50, 52, respectively, to permit the pivotal movement of boom B about a horizontal axis adjacent the upper end of forward link structure C. A rigid lateral bearing pin 89 is mounted between gusset plates 78, 80 intermediate boom arm B and side plates 46, 48 to connect the upper end of the boom arm actuating means, as will become apparent. The rear end of boom arm B is pivotally mounted to the upper end of rear link structure D by means of bearing member 70. As shown in FIGURES 5 and 9, bearing member 70 includes an outer tubular member 71 surroundingly engageable with and rotatable about a pivot pin 73 which extends through and is staked to side plates 66, 68 of rear link structure D. The rear end of boom arm B is welded to tubular member 71 for rotation about pivot pin 73 on a horizontal axis.

Also mounted on bearing member 70 for pivotal movement in a vertical plane about pin 73 are a pair of vertically disposed spaced parallel triangular plates 90, 92 having a lateral pin 94 connecting their upper corners and a lateral pin 96 connecting the corners thereof forward of bearing member 70. The lateral pivot pin 94 is in general alignment with the axis of support members 56 and 58 of rear link structure D. Plates 90 and 92 provides means for self levelling and tilting of the load carrier E during all positions of the boom arm B. Collars 93, 95 laterally support plates 90 and 92. The self-levelling means further includes hydraulic power means 100 consisting of a hydraulic cylinder 102 pivotally secured by means of an elongated tubular support 103 at its lower end to a bracket 104 secured to a lateral support 106 extending across frame 10 forwardly of its rear end. See FIGURES 5 and 13. The piston rod 108 of cylinder 102 is pivotally connected at its upper end, as at 105, to pivot pin 96.

Overlying boom arm B is a first elongated rod 110 pivotally fastened at its rear end, as at 111, to pivot pin 94 and clevis mounted for pivotal movement at its forward end to the upper ends of a pair of closely spaced parallel link members 112, 114 pivotally mounted at their lower ends laterally of boom arm B by means of a rigid support pin 116, which is carried on the side of boom arm B towards side plate 14 of frame 10 and near the forward end of straight section 76 thereof. Extending forwardly from and pivotally connected to pin 115 is a second elongated rod 120 pivotally secured at its forward end to a rearwardly extending bracket 122 attached to load carrier E for self levelling of the load carrier E. Parallelism of the structure is afforded by virtue of the parallelogram location of the pivot points described. Thus, the four corners of one parallelogram are formed by pivots 123, 124, 116 and 95 while pivots 115, 116, 73 and 94 form the second parallelogram.

The cylinder 102 is in a hydraulic circuit and under the control of any suitable operator controlled valve

mechanism 200 which in known manner permits introduction of pressure fluid to one of the ends of the cylinder while exhausting from the other and which permits retention of fluid in both ends of the cylinder to hold the piston in any desired set position. Thus, through the action of the cylinder 102, the load carrier E may be adjusted at all heights by virtue of the parallelogram linkage described or tilting action may be effectuated by operator control of the piston within cylinder 102. The forward end of boom arm B terminates in a laterally extending arm 130. A pair of load carrier supports 132 extend forwardly in a laterally spaced parallel manner from the ends of arm 130. The load carrier E is pivotally carried at the forward ends of supports 132 by virtue of rear bracket members 136 and is connected to the self-levelling and tilt rod 120 by means of bracket 122. As shown in the drawings, load carrier E may take the form of a building material handling structure having an upstanding rear platform 138 and forwardly extending laterally spaced forks or tines 140.

Hydraulic hoist cylinder means 150 is mounted between frame 10 and boom arm B to provide the lifting and reaching action inherent in the design of the machine. This means includes an hydraulic cylinder 152 pivotally carried at its lower end by a pivot pin 154 situated below the plane of frame 10 between a pair of depending laterally spaced support plates 156, 158, which are carried between lateral frame members 106 and 160 of frame 10. The piston rod 162 of cylinder 152 is pivotally connected to pivot pin 89, as at 163 between plates 78, 80, as previously described.

The hydraulic cylinder 152 is in a hydraulic circuit and under the control of any suitable operator controlled valve mechanism 200 which in known manner permits introduction of pressure fluid to one of the ends of the cylinder while exhausting from the other and which permits retention of fluid in both ends of the cylinder to hold the piston in any desired set position. Thus through the action of the cylinder 152, the boom arm B may be raised or lowered according to the demands of a particular job.

Valve mechanism 200 is shown as a valve bank having a plurality of valves therein to accommodate the hydraulic requirements of the machine. A plurality of rods 206 connect valve mechanism 200 with suitable operator controls 208 located in a convenient position upon platform 24. The drawings indicate three such rods, with the extra rod being provided for an auxiliary hydraulic system and valve means for operating, as an example, a remote controlled concrete hopper, a telescopic boom attachment and the like. Suitable filter means 210 are also provided for the hydraulic circuits described with pump means (not shown) providing hydraulic energy in a known manner.

In use, the machine of this invention can be used for lifting, carrying and delivering various loads such as building material, lumber, concrete and the like. As shown in FIGURES 11 and 14 through 17, a forward reaching action results from the combination and arrangement of the parts previously described. By pivoting boom arm B about the upper ends of forward link structure C and rear link structure D in the manner described, the maximum forward reach (over 7' in front of the tires) is obtained in the most ideal working height range which is generally from about 9' to 18'. This feature is illustrated in FIGURE 11 by the dotted line indications I, II therein. In FIGURE 14 the machine is shown with the load carrier E in a lowered position ready to pick up a load. In FIGURES 15 and 16 the boom arm B is shown with the load carrier E in a forward reaching position similar to that illustrated by the dotted lines I, II of FIGURE 11. FIGURE 16 illustrates the machine with the load carrier in an elevated position. All of these movements involving lowering and raising and reaching and retracting are accomplished by the use of but the single hydraulic means 150. By carrying the loads farther forward or rearward, i.e., shifting the weight, the operator can instantly change

traction on the drive wheels 19 to get through mud, snow or sand.

As can be clearly seen in FIGURES 3, 12 and 17, link structures C and D provide a pyramidal type of support for boom arm B. That is to say, support members 36, 38 of forward link structure C and support members 56, 58 of rear link structure D are spaced apart at their lower ends a distance equal to the width of frame 10 to give boom arm B maximum lateral stability. Maximum longitudinal stability is afforded by the full-frame length separation of link structures C and D.

Safe operator position and unobstructed visibility are additional features resulting from the design of the machine. The operator's position to the side (not behind or between the lift arms) and away from all moving parts minimizes danger and injury. His side position plus the simple clean construction of the lift arm also gives him a clear view of the forks and lift arm at all heights, and an unobstructed view of the surrounding area. The operator can position the loader a safe distance away from a building or scaffold and still easily elevate and place or pick up loads off of scaffolds or roofs, in doorways or windows. Unsafe and time consuming ground movement of the machine is kept to an absolute minimum during the lifting operation.

The invention has been thoroughly tested and found to be completely satisfactory for the uses intended. While there has been disclosed a preferred embodiment thereof it should be specifically understood that same is capable of considerable modification without departure from the scope and spirit of the appended claims.

I claim:

1. In a loader, a mobile frame, upwardly and rearwardly inclined forward link structure pivotally mounted at its lower end to the forward end of said frame, upwardly extending rear link structure pivotally mounted at its lower end to the rear of said frame, said forward and said rear link structure each including laterally converging support members and forming with said frame generally pyramidal boom support means, a boom pivotally carried by the upper ends of said forward and rear link structure, and hydraulic cylinder means extending between the boom and the frame spaced lengthwise of the boom from said rear link structure for raising and lowering and advancing and retracting said boom.

2. In a loader, a mobile longitudinal frame, upwardly and rearwardly inclined forward link structure pivoted at its lower end to the forward end of said frame about a horizontal axis to swing in a vertical plane, said forward link structure including lower support members secured to opposite sides of said frame, at least one of said support members converging toward the other to form therewith at the upper ends thereof first boom mounting means, upright rear link structure pivoted at its lower end to the rear end of said frame about a horizontal axis to swing through a vertical position, said rear link structure including lower support members secured to opposite sides of said frame, at least one of said support members converging toward the other to form therewith at the upper ends thereof second boom mounting means, said first and second boom mounting means being in longitudinally spaced lateral alignment with each other above said frame to form therewith a generally pyramidal boom support, a forwardly extending boom pivoted about at its rear to said second boom mounting means and pivotally supported forwardly of said rear link structure by said first boom mounting means, a load engaging device carried by the forward end of said boom, and power means for pivoting said pivoted parts to advance and retract and raise and lower said load engaging device.

3. The loader described in claim 2 wherein said boom is carried by said mounting means parallel to and laterally spaced to one side of the longitudinal centerline of said frame.

4. The loader described in claim 2 wherein said power means includes a single hydraulic cylinder extending between said frame and said first boom mounting means and generally parallel to said rear link structure.

5. In a high lift mobile loader, the combination comprising:

a mobile frame,
upwardly and rearwardly inclined forward link structure pivoted at its lower end to the front of said frame,

upwardly extending rear link structure pivoted at its lower end to the rear of said frame,

a forwardly extending boom pivotally carried at its rear end by said rear link structure and pivotally carried forwardly of its rear end by said forward link structure, and

hydraulic cylinder means extending between the boom and the frame for raising and lowering and advancing and retracting the boom,

said hydraulic cylinder means being generally parallel to said rear link structure and secured to said boom substantially adjacent its connection with said forward link structure whereby when said cylinder means is initially extended said forward link structure is pivoted about its axis upwardly and forwardly to impart a forward reaching action to said boom throughout the working height range of the boom.

6. The loader described in claim 5 wherein said hydraulic cylinder means consists of a single hydraulic cylinder.

7. In a high lift mobile loader, the combination comprising:

a mobile frame,
upwardly and rearwardly inclined forward link structure pivoted at its lower end to the front of said frame,

upwardly extending rear link structure pivoted at its lower end to the rear of said frame,

a forwardly extending boom pivotally supported at its rear end by the upper end of said rear link structure and pivotally supported forwardly of its rear end by said forward link structure,

load-engaging structure carried by the boom at its front end, and

hydraulic cylinder means extending between said boom and said frame spaced lengthwise of said rear link structure and generally parallel thereto,

said forward link structure and said rear link structure being connected to the boom whereby to impart a forward reaching movement to said load-engaging structure when said hydraulic cylinder means is initially extended and said boom is raised from a lowered position.

8. The loader described in claim 7 wherein the forward reaching said boom is obtained in the working height range of said load engaging structure.

9. The loader described in claim 7 wherein said hydraulic cylinder means consists of a single hydraulic cylinder.

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